WHAT IS CLAIMED IS:

1. A method for measuring blood oxygen saturation, comprising the steps of:

providing a sensor and a pulse oximeter;

selecting a light source and a light detector;

optimizing a wavelength spectrum of light received by said light detector from said light source for an oxygen saturation reading less than 80 percent;

placing said sensor on a patient; and

determining said blood oxygen saturation using said sensor and said pulse oximeter.

2. The method of claim 1, wherein said optimizing step is for an oxygen saturation of a fetus.

3. The method of claim 2, including optimizing said wavelength spectrum for an oxygen saturation reading less than 65 percent.

4. The method of claim 2, including optimizing said wavelength spectrum for an oxygen saturation reading greater than 15%.

5. The method of claim 2 further comprising the step of:

placing a detector on said sensor;

optimizing a spacing of said light source from said detector to reduce the sensitivity of said sensor to perturbation induced artifact; and

measuring the intensity of light from said light source at said detector using light scattered through said fetus.

6. The method of claim 4 wherein a spacing between where said light is injected into said tissue and collected from said tissue is at least 10 mm.

7. The method of claim 1 wherein said received light comprises a red spectrum and an infrared spectrum, each of said red and infrared spectrums having an extinction and a scattering coefficient associated with blood perfused tissue, said optimizing step comprising choosing wavelength spectrums within said red and infrared spectrums whose product of their respective extinction and scattering coefficients form first and second

values, a ratio between said first and second values being between 0.5 and 2 for a majority of the oxygen saturation reading range of 0 to 65 percent.

8. The method of claim 2 wherein said received light comprises a red spectrum and an infrared spectrum, said optimizing step comprising using a first spectrum within said infrared spectrum in a range useful for a patient having high saturation, and optimizing the red spectrum to a second spectrum for a fetus.

9. The method of claim 8 wherein the mean wavelength of said second spectrum is between 700 and 790 nanometers.

10. The method of claim 8 wherein said second spectrum includes 735 nanometers at an intensity of at least 50% of the intensity of any other wavelengths in said second spectrum.

11. The method of claim 2 wherein said optimizing step increases a depth of penetration of said light in a fetus compared to an optimum penetration depth for a patient having high saturation.

12. The method of claim 1 wherein said optimizing step reduces the sensitivity of said determining step to artifact.

13. The method of claim 1 wherein said optimizing step includes selecting said light source to have a desired wavelength spectrum.

14. The method of claim 1 wherein said optimizing step includes selecting said light detector which detects a limited spectrum of light.

15. The method of claim 1 wherein said optimizing step includes filtering said light source to pass a desired wavelength spectrum.

16. The method of claim 1 further comprising the step of alternately optimizing said wavelength spectrum of light received by said light detector from said light source for an oxygen saturation reading greater than 80 percent.

17. A method for measuring blood oxygen saturation in a fetus, comprising the steps of:

providing a sensor and a pulse oximeter;

selecting a light source and a light detector;

detecting light at said detector comprising red and infrared spectrums;

selecting the infrared spectrum so as to have a wavelength spectrum useful for measuring oxygen saturation in a patient with high saturation;

optimizing a wavelength spectrum of said red spectrum to a mean wavelength between 700 and 790 nanometers for an oxygen saturation reading between 15 and 65 percent, said optimizing increasing an immunity of a measurement of blood oxygen saturation to perturbation artifact;

placing said sensor on said fetus;

measuring an intensity of at least two light signals from said light source at said light detector after being scattered through a portion of said fetus; and

determining said blood oxygen saturation using said intensity and said pulse oximeter.

18. The method of claim 17 further comprising the step of measuring a third light signal from detected light scattered through a portion of said fetus, the third light signal having a mean wavelength less than 700 nanometers and being optimized for an oxygen saturation reading greater than 65% percent.

19. A method for using a pulse oximeter to measure blood oxygen saturation in a patient, comprising the steps of:

selecting a light source and a light detector for a sensor;

detecting light at said detector comprising first and second light spectrums, each of the light spectrums having an extinction and a scattering coefficient associated with blood perfused tissue;

optimizing said light spectrums by choosing wavelength spectrums whose product of their respective extinction and scattering coefficients form first and second values, a ratio between said first and second values being between 0.5 and 2 for a majority of the oxygen saturation reading range of 0 to 65 percent;

placing said sensor on said patient; and

determining said blood oxygen saturation using said sensor and said pulse oximeter.

20. The method of claim 19 further comprising the step of alternately optimizing said light spectrum for an oxygen saturation reading range greater than 65% percent.

21. A method for measuring blood oxygen saturation in a fetus, comprising the steps of:

providing a sensor and a pulse oximeter;

selecting a far red and infrared light source and a light detector;

detecting light at said detector including an infrared wavelength spectrum useful for measuring oxygen saturation in a patient with high saturation, the detected light including a far red wavelength spectrum which has a mean wavelength between 700 and 790 nanometers;

placing said light sources in a single encapsulated package and mounting said package on said sensor;

placing said sensor on said fetus;

measuring an intensity of light from said light source at said light detector after scattering through a portion of said fetus; and

determining said blood oxygen saturation using said intensity and said pulse oximeter.

22. The method of claim 21 further comprising the steps of:

selecting a second red light source;

selecting a wavelength spectrum of said second red light source to have a mean wavelength less than 700 nanometers; and

selectively activating either or both said first mentioned or second red light source.

23. A fetal pulse oximeter sensor comprising:

a housing;

at least one light source mounted in said housing;

at least one detector mounted in said housing;

means for detecting light subsequent to being scattered by fetal tissue, the light including an infrared light spectrum, said infrared spectrum having a range useful for measuring oxygen saturation in a patient with high saturation, the detected light also

including a red light spectrum, said red light spectrum having a mean wavelength between 700 and 790 nanometers; and

said detector being mounted in said housing spaced from said light sources and positioned to detect light from said light sources.

24. The sensor of claim 23 wherein said light source comprises at least one LED.

25. The sensor of claim 23 wherein said light source comprises red and infrared light sources spaced from said detector by at least 10 mm.

26. The sensor of claim 23 wherein said light source comprises red and infrared light sources spaced from said detector by at least 14 mm.

27. The sensor of claim 23 wherein said means for providing comprises a light source which emits a limited spectrum.

28. The sensor of claim 23 wherein said means for providing comprises a filter between said light source and said detector for passing a limited spectrum of light.

29. The sensor of claim 23 wherein said means for providing comprises a wavelength sensitive detector which detects a limited spectrum of light.

30. The sensor of claim 23 further comprising:

means for providing a red light spectrum having a mean wavelength less than 700 nanometers.

31. The sensor of claim 30 wherein

said means for providing a red light spectrum having a mean wavelength between 700 and 790 nanometers is a first light emitting diode; and

said means for providing a red light spectrum having a mean wavelength less than 700 nanometers is a second light emitting diode.

32. A sensor for a pulse oximeter for measuring blood oxygen saturation, comprising:

a light source;

a light detector;

one of said light source and light detector including means for providing light comprising first and second spectrums, each of the spectrums being optimized for the products of their respective extinction and scattering coefficients in blood perfused tissue, the products forming first and second values, a ratio between said first and second values being between 0.5 and 2 for a majority of the oxygen saturations less than 80 percent.

33. The sensor of claim 32 wherein said light source and said detector are spaced apart by at least 14 mm.

34. The sensor of claim 32 further comprising means for providing a red spectrum having a mean wavelength less than 700 nanometers.

35. A sensor for a pulse oximeter for measuring blood oxygen saturation in a fetus, comprising:

a radiation source;

a radiation detector;

at least one of said source and detector being optimized for reducing the sensitivity of a blood oxygen saturation measurement to perturbation induced artifact for saturations less than 65 percent.

36. The sensor of claim 35 wherein said radiation source comprises red and infrared LEDs spaced from said detector by at least 10 mm.

37. The sensor of claim 35 wherein said radiation source comprises red and infrared LEDs spaced from said detector by at least 14 mm.

38. The sensor of claim 35 further comprising means for alternately optimizing said source and detector for oxygen saturation readings greater than 65%.

39. The sensor of claim 38 further comprising a second red light source having a mean wavelength less than 700 nanometers.

40. A sensor for measuring blood oxygen saturation in a fetus, comprising:

an infrared light source having a wavelength spectrum useful for measuring oxygen saturation in a patient with high saturation;

a deep red light source having a mean wavelength between 700 and 790 nanometers; and

a single encapsulated package enclosing said red and infrared light sources, said package being mounted on said sensor.

41. A method of using a pulse oximeter, comprising the steps of:

receiving at least first and second signals from a sensor obtained by scattering light through tissue, the light having at least first and second wavelength spectrums, the first and second spectrums being optimized for an oxygen saturation reading less than 80%; and

calculating the oxygen saturation using coefficients suitable for the first and second optimized spectrums.

42. A method for measuring blood oxygen saturation in a fetus, comprising the steps of:

providing a sensor and a pulse oximeter;

selecting a light source and a far red and infrared light detector;

detecting light at said detector including an infrared light wavelength spectrum useful for measuring oxygen saturation in a patient with high saturation, the detected light including a far red wavelength spectrum which has a mean wavelength between 700 and 790 nanometers;

placing said light detectors in a single encapsulated package and mounting said package on said sensor;

placing said sensor on said fetus;

measuring an intensity of light from said light source at said light detectors after scattering through a portion of said fetus; and

determining said blood oxygen saturation using said intensity and said pulse oximeter.

43. The method of claim 42 further comprising the steps of:

selecting said detector to detect a second red light spectrum;

selecting a wavelength spectrum of said second red light spectrum to have a mean wavelength less than 700 nanometers; and

selectively detecting either or both said first mentioned or second red light spectrums.

44. A pulse oximeter comprising:

an input connector for receiving at least first and second signals from a sensor obtained by scattering light through tissue, the light having at least first and second wavelength spectrums;

a memory storing coefficients suitable for said first and second spectrums, the spectrums being optimized for an oxygen saturation reading less than 80%; and

a processor, coupled to said memory and said input connector, for calculating the oxygen saturation using said coefficients.

45. The pulse oximeter of claim 44 wherein said first wavelength spectrum has a mean wavelength between 700 and 790 nanometers.

46. The pulse oximeter of claim 45 further comprising:

a detector coupled to said connector for detecting a coding signal from a sensor indicative of a mean wavelength between 700 and 790 nanometers for said first wavelength spectrum.

47. The pulse oximeter of claim 46 further comprising:

a decoder, coupled to said detector and said memory, for selecting appropriate coefficients from said memory based on said coding signal.

48. The pulse oximeter of claim 46 wherein said detector further comprises means for passing a current through an impedance element in said sensor, said impedance element having a value indicative of a mean wavelength between 700 and 790 nanometers for said first wavelength spectrum.

49. A fetal pulse oximeter comprising:

an input connector for receiving at least first and second signals from a sensor obtained by scattering light through tissue of a fetus, the light having at least red and infrared spectrums;

a memory storing coefficients suitable for said infrared spectrum having a range useful for measuring oxygen saturation in a patient with high saturation and said red light spectrum having a mean wavelength between 700 and 790 nanometers; and

a processor, coupled to said memory and said input connector, for calculating the oxygen saturation of said fetus using said coefficients.

50. The pulse oximeter of claim 49 wherein said memory further comprises:

coefficients for a red light spectrum having a mean wavelength less than 700 nanometers.

51. A pulse oximeter, comprising:

an input connector for receiving at least first and second signals from a sensor obtained by scattering light through tissue, the light having at least red and infrared spectrums;

a memory storing coefficients suitable for said spectrums, each of the spectrums being optimized for the products of their respective extinction and scattering coefficients in blood perfused tissue, the products forming first and second values, a ratio between said first and second values being between 0.5 and 2 for a majority of oxygen saturations less than 80 percent; and

a processor, coupled to said memory, for calculating the oxygen saturation using said coefficients.

52. A pulse oximeter for measuring blood oxygen saturation in a fetus, comprising:

an input connector for receiving at least first and second signals from a sensor obtained by detecting light having at least red and infrared spectrums, the light being scattered from tissue;

a memory storing coefficients suitable for said spectrums being optimized for reducing the sensitivity of a blood oxygen saturation measurement to perturbation induced artifact for saturations less than 65 percent; and

a processor, coupled to said memory, for calculating the oxygen saturation using said coefficients.